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EXAMINER

EDMONDSON, LYNNE RENEE

ART UNIT	PAPER NUMBER
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1725

DATE MAILED: 02/20/2003

8

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/010,083

Applicant(s)

GORINA ET AL.

Examiner

Lynne Edmondson

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-- **The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 12/10/02.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-56 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-22, 24-35, 37, 38 and 40-56 is/are rejected.
- 7) ☒ Claim(s) 23, 36 and 39 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 09 November 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2.
- 4) ☐ Interview Summary (PTO-413) Paper No(s) _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

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DETAILED ACTION

Allowable Subject Matter

1. The indicated allowability of claims 17, 31, 39, 42 and 43 is withdrawn in view of the newly discovered reference(s) to growth rates and low temperature heat treatments.

Rejections based on the newly cited reference(s) follow.

Claim Rejections - 35 USC 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless --

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 25, 27 and 32 are rejected under 35 U.S.C. 102(b) as being anticipated by Richards et al. (USPN 5143751).

Richards teaches a method of synthesizing a doped lanthanum chromite current passage and porous nickel cermet fuel electrode. Organometallic mixtures are dispersed and mixed with an organic carrier and deposited on the cathode and electrolyte respectively after which the assembly is thermally treated for forming (col 3

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line 55 – col 4 line 55 and col 5 lines 25-41). The ratio of solid and liquid phases is presumably between 1/100 and 15/100 or between 1/3 and 5/7 as the material forms a slurry (col 4 lines 48-52). Powders are treated under vacuum at a temperature below 600 C (col 7 lines 49-65, col 8 lines 23-39 and lines 59-66).

3. Claims 1-5, 12-15, 24-29, 33-35, 37 and 38 are rejected under 35 U.S.C. 102(e) as being anticipated by Mukherjee et al. (USPN 5919587).

Mukherjee teaches a method of manufacturing a fuel cell comprising formation of an electrolyte, cathode and anode as well as additional layers which would include an interface (catalyst) layer, insulating layer and current passage (separator) (col 11 line 62 - col 12 line 4). The materials are made using the same apparatus wherein cell components are formed from a metal-organic complex containing a transition metal from the group including but not limited to Ti, Co, Ni, Hf and Zr. The organometallic has the common formula $(CH_3-CH_2-CO_2)_nMe$ wherein n is a number ranging from 0 to 72 and Me is a transition metal which will have a valence. Cobalt is typically 3 or 4. The mixture is initially heated to 100 C in the presence of a mineral acid or alcohol (col 12 lines 5-64 and col 21 lines 46-56) reacted with a Zr salt (col 5 lines 26-46 and lines 55-65). Note that the common formula is an organic functional group which can be combined in a variety of forms. The metal organic is used as a binder for forming the cathode mass (col 21 lines 18-27) and is used as the liquid phase carrier for mixing (col

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22 lines 1-36). Combinations of Y and Zr are used as electrolyte materials and doped zirconia (such as YSZ) is a well-known electrolyte material. The metal content in the carboxylate is between 2 and 40 wt% that is between 20 and 400g per kg (col 10 lines 9-26). See Mukherjee claims 1-3, 7-9, 38-40 and 51.

4. Claims 6, 8-10, 25, 27-30 and 32 are rejected under 35 U.S.C. 102(e) as being anticipated by Zhen et al. (USPN 6093234).

Zhen teaches a method of making a fuel cell component layers including current passage and interfacial layers by synthesizing a doped lanthanum chromite which is dispersed, ground, mixed in an organic carrier, deposited on a cathode foam and sintered to form a film (coating) (col 2 lines 32-49). The mixture comprises 4% binder (1g of 22.5g in Example XVIII). The ratio between solid and liquid phases is within the range 1/100 and 15/100. The metal concentration is 50g per kg of nitrates. However, it is taught that carboxylates and carboxylic acids may be used in a similar processes (col 1 lines 46-60) and the mixture may be sprayed (col 3 lines 40-48). Deposition (typically painting or printing) occurs in air (col 7 line 65 - col 8 line 34 and col 3 lines 3-34) but can be performed in any desired atmosphere including reducing and inert (col 7 lines 47-50 and col 8 lines 31-35). Materials are formed at low temperatures such at 200 C and 400 C (col 3 line 17 and col 4 lines 30-32). Zr alcoholates may be formed and mixed at an initial temperature below 100 C (col 1 lines 36-60). Firing temperatures are

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dependent upon the materials employed and desired density however an example is taught wherein nitrates are jointly precipitated, pressed and heated to 1250 and 1350 C (col 8 lines 58-64 and col 12 lines 50-65) but can be as low as 400 C (col 4 lines 22-35). A cermet layer comprising Ni or cobalt may be employed to form the fuel electrode (col 4 lines 47-56, col 9 lines 26-45 and col 11 lines 10-35).

5. Claims 25, 27-30, 44, 46, 51 and 52 are rejected under 35 U.S.C. 102(e) as being anticipated by Singh et al. (USPN 5516597).

Singh teaches a method of synthesizing a doped lanthanum chromite current passage and porous nickel cermet fuel electrode (col 1 lines 26-62). Organometallic mixtures are dispersed and mixed with an organic carrier and deposited on the cathode and electrolyte respectively after which the assembly is thermally treated for forming. (col 4 lines 1-64). The ratio of solid and liquid phases is presumably between 1/100 and 15/100 or between 1/3 and 5/7 as the material forms a gel (col 4 lines 51-59). The cathode is a doped LaMnO_3 (col 6 lines 44-59). The material is typically deposited as a paste, by brushing, painting or spraying under ambient conditions (col 7 lines 33-45). Ce particle size is about 0.1 to 1 micron (col 8 lines 7-10).

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Claim Rejections - 35 USC 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 16, 18, 19 and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mukherjee et al. (USPN 5919587) in view of Zhen et al. (USPN 6093234).

Mukherjee teaches a method of manufacturing a fuel cell comprising formation of an electrolyte, cathode and anode as well as additional layers which would include an interface (catalyst) layer, insulating layer and current passage (separator) (col 11 line 62 - col 12 line 4). The materials are made using the same apparatus wherein cell components are formed from a metal-organic complex containing a transition metal from the group including but not limited to Ti, Co, Ni, Hf and Zr. The organometallic has the common formula $(CH_3-CH_2-CO_2)_nMe$ wherein n is a number ranging from 0 to 72 and Me is a transition metal which will have a valence. Cobalt is typically 3 or 4. The mixture is initially heated to 100 C in the presence of a mineral acid or alcohol (col 12

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lines 5-64 and col 21 lines 46-56) reacted with a Zr salt (col 5 lines 26-46 and lines 55-65). Note that the common formula is an organic functional group which can be combined in a variety of forms. The metal organic is used as a binder for forming the cathode mass (col 21 lines 18-27) and is used as the liquid phase carrier for mixing (col 22 lines 1-36). Combinations of Y and Zr are used as electrolyte materials and doped zirconia (such as YSZ) is a well known electrolyte material. The metal content in the carboxylate is between 2 and 40 wt% that is between 20 and 400g per kg (col 10 lines 9-26). Although it is taught that materials are applied at temperatures greater than 100 degrees this temperature is not further disclosed.

Zhen teaches a method of making a fuel cell component layers including current passage and interfacial layers by synthesizing a doped lanthanum chromite which is dispersed, ground, mixed in an organic carrier, deposited on a cathode foam and sintered to form a film (coating) (col 2 lines 32-49). Materials are formed at low temperatures such at 200 C and 400 C (col 3 line 17 and col 4 lines 30-32). Zr alcoholates may be formed and mixed at an initial temperature below 100 C (col 1 lines 36-60). Firing temperatures are dependent upon the materials employed and desired density however an example is taught wherein nitrates are jointly precipitated, pressed and heated to 1250 and 1350 C (col 8 lines 58-64 and col 12 lines 50-65) but can be as low as 400 C (col 4 lines 22-35). The mixture comprises 4% binder (1g of 22.5g in Example XVIII). The ratio between solid and liquid phases is within the range 1/100

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and 15/100. The metal concentration is 50g per kg of nitrates. However, it is taught that carboxylates and carboxylic acids may be used in a similar processes (col 1 lines 46-60) and the mixture may be sprayed (col 3 lines 40-48). Deposition (typically painting or printing) occurs in air (col 7 line 65 - col 8 line 34 and col 3 lines 3-34) but can be performed in any desired atmosphere including reducing and inert (col 7 lines 47-50 and col 8 lines 31-35). A cermet layer comprising Ni or cobalt may be employed to form the fuel electrode (col 4 lines 47-56, col 9 lines 26-45 and col 11 lines 10-35).

It would have been obvious to one of ordinary skill in the art at the time of the invention to optimize processing temperatures for the materials employed to enhance ionic transport and prevent large increases in internal cell resistance (Mukherjee, col 3 lines 24-31).

7. Claims 20-22, 30, 39-47 and 49-56 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mukherjee et al. (USPN 5919587) in view of Jensen (USPN 5141825).

Mukherjee teaches a method of manufacturing a fuel cell comprising formation of an electrolyte cathode and anode as well as additional layers which would include an interface (catalyst) layer, insulating layer and current passage (separator) (col 11 line 62 - col 12 line 4). The materials are made using the same apparatus wherein cell components are formed from a metal-organic complex containing a transition metal

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from the group including but not limited to Ti, Co, Ni, Hf and Zr. The organometallic has the common formula $(CH_3-CH_2-CO_2)_nMe$ wherein n is a number ranging from 0 to 72 and Me is a transition metal which will have a valence. Cobalt is typically 3 or 4. The mixture is initially heated to 100 C in the presence of a mineral acid or alcohol (col 12 lines 5-64 and col 21 lines 46-56) reacted with a Zr salt (col 5 lines 26-46 and lines 55-65). Note that the common formula is an organic functional group which can be combined in a variety of forms. The metal organic is used as a binder for forming the cathode mass (col 21 lines 18-27) and is used as the liquid phase carrier for mixing (col 22 lines 1-36). Combinations of Y and Zr are used as electrolyte materials and doped zirconia (such as YSZ) is a well known electrolyte material. The metal content in the carboxylate is between 2 and 40 wt% that is between 20 and 400g per kg (col 10 lines 9-26). The atmosphere may be air, reducing or inert. Individual electrodes or half elements are heat treated under vacuum at a temperature of 60-110 C (col 27 lines 35-40 and col 28 lines 11 – 26). Coatings are taught as up to 25 microns (col 24 lines 59-63) and teaches coatings of 5 to 7 microns (col 32 lines 43-50). However, material particle size and shape are not disclosed. Neither are Ce oxide or Ni/Co anodes disclosed.

Jensen teaches synthesis of electrode materials comprising modified Zr oxides having particle size less than 2 microns present in an amount of about 1% (col 3 lines 9-19). Ni and Co particles are spherical with a diameter of 3 to 7 microns (col 3 lines 62-

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67). Particles may also have a thread like (filamentary) shape (col 3 lines 12-15 and col 4 lines 35-46). CeO₂ may be used as a substitute for ZrO₂ (col 5 lines 47-50). Processing may be performed in an inert atmosphere such as N₂ (col 7 lines 50-60).

It would have been obvious to one of ordinary skill in the art at the time of the invention that Ce oxides are equivalents for Zr oxides in fuel cell materials and that Ni and/or Co anodes are conventional. By using materials with small particle size in an inert atmosphere, corrosion is prevented (Mukherjee, col 3 lines 23-31) while improving cell efficiency and utilization (Mukherjee, col 4 lines 52-61).

8. Claims 17 and 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mukherjee et al. (USPN 5919587) in view of Pal et al. (USPN 4895576).

Mukherjee teaches a method of manufacturing a fuel cell comprising formation of an electrolyte cathode and anode as well as additional layers which would include an interface (catalyst) layer, insulating layer and current passage (separator) (col 11 line 62 - col 12 line 4). The materials are made using the same apparatus wherein cell components are formed from a metal-organic complex containing a transition metal from the group including but not limited to Ti, Co, Ni, Hf and Zr. The organometallic has the common formula (CH₃-CH₂-CO₂)_nMe wherein n is a number ranging from 0 to 72 and Me is a transition metal which will have a valence. Cobalt is typically 3 or 4. The mixture is initially heated to 100 C in the presence of a mineral acid or alcohol (col 12

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lines 5-64 and col 21 lines 46-56) reacted with a Zr salt (col 5 lines 26-46 and lines 55-65). Note that the common formula is an organic functional group which can be combined in a variety of forms. The metal organic is used as a binder for forming the cathode mass (col 21 lines 18-27) and is used as the liquid phase carrier for mixing (col 22 lines 1-36). Combinations of Y and Zr are used as electrolyte materials and doped zirconia (such as YSZ) is a well known electrolyte material. The metal content in the carboxylate is between 2 and 40 wt% that is between 20 and 400g per kg (col 10 lines 9-26). The atmosphere may be air, reducing or inert. Individual electrodes or half elements are heat treated under vacuum at a temperature of 60-110 C (col 27 lines 35-40 and col 28 lines 11 – 26). However, there is no disclosure of a growth rate.

Pal teaches synthesis of electrode materials comprising Sr doped LaMnO₃ (col 1 lines 16-29 and col 2 lines 24-54) wherein the particles are grown over a period of 0.5 to 2 hours to a thickness of 30 to 50 microns which is a 15-100 micron per hour rate (col 5 lines 37-50). A gas tight layer of 1 micron is taught (col 4 lines 1-25).

It would have been obvious to one of ordinary skill in the art at the time of the invention to employ a conventional growth rate to quickly form electrodes with high cell efficiency and utilization (Mukherjee, col 4 lines 52-61) which are not easily poisoned (fouled) by sulfur (Mukherjee, col 3 lines 18-31).

9. Claim 31 is rejected under 35 U.S.C. 103(a) as being unpatentable over Singh et

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al. (USPN 5516597) in view of Pal et al. (USPN 4895576).

Singh teaches a method of synthesizing a doped lanthanum chromite current passage and porous nickel cermet fuel electrode (col 1 lines 26-62). Organometallic mixtures are dispersed and mixed with an organic carrier and deposited on the cathode and electrolyte respectively after which the assembly is thermally treated for forming. (col 4 lines 1-64). The ratio of solid and liquid phases is presumably between 1/100 and 15/100 or between 1/3 and 5/7 as the material forms a gel (col 4 lines 51-59). The cathode is a doped LaMnO_3 (col 6 lines 44-59). The material is typically deposited as a paste, by brushing, painting or spraying under ambient conditions (col 7 lines 33-45). Ce particle size is about 0.1 to 1 micron (col 8 lines 7-10). However, there is no disclosure of growth rate.

Pal teaches synthesis of electrode materials comprising Sr doped LaMnO_3 (col 1 lines 16-29 and col 2 lines 24-54) wherein the particles are grown over a period of 0.5 to 2 hours to a thickness of 30 to 50 microns which is a 15-100 micron per hour rate (col 5 lines 37-50). A gas tight layer of 1 micron is taught (col 4 lines 1-25).

It would have been obvious to one of ordinary skill in the art at the time of the invention to employ a conventional growth rate to quickly form electrodes with good electrical, chemical and mechanical properties (Singh, col 2 lines 37-61).

10. Claim 48 is rejected under 35 U.S.C. 103(a) as being unpatentable over Singh et

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al. (USPN 5516597) in view of Xue (USPN 5702837).

Singh teaches a method of synthesizing a doped lanthanum chromite current passage and porous nickel cermet fuel electrode (col 1 lines 26-62). Organometallic mixtures are dispersed and mixed with an organic carrier and deposited on the cathode and electrolyte respectively after which the assembly is thermally treated for forming. (col 4 lines 1-64). The ratio of solid and liquid phases is presumably between 1/100 and 15/100 or between 1/3 and 5/7 as the material forms a gel (col 4 lines 51-59). The cathode is a doped LaMnO_3 (col 6 lines 44-59). The material is typically deposited as a paste, by brushing, painting or spraying under ambient conditions (col 7 lines 33-45). Ce particle size is about 0.1 to 1 micron (col 8 lines 7-10). However, there is no of the amounts of metal and ceramic in the anode.

Xue teaches a method of synthesizing a doped lanthanum chromite current passage and porous nickel cermet fuel electrode (col 1 lines 13-26). Ni:Zr ratio is about 1.1:1.0 at the high end of the range (col 3 lines 53-60). Organometallic mixtures are dispersed and mixed with an organic carrier (binder) and deposited on the cathode and electrolyte respectively after which the assembly is thermally treated for forming. Ni and ZrO_2 are added in equal amounts (col 3 lines 5-52). The ratio of solid and liquid phases is between 1/3 and 6/1 (col 4 lines 28-36). The metal in the cermet is nickel or cobalt (col 3 lines 6-10) and is mixed with rough dispersed ion conductive material (ZrO_2) and 2-20% binder (col 3 line 53 - col 4 line 17). The material is typically deposited as a

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paste, by brushing or spraying under ambient conditions (col 6 lines 58-64). Parts are heated to a temperature below 1350 C (col 3 lines 53-65).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use equal amounts of electrolyte material (Ce or Zr) and metal (Ni and/or Co) to improve cell efficiency, life expectancy and mechanical properties in a simple and reliable manner (Singh, col 2 lines 30-61).

11. Claim 48 is rejected under 35 U.S.C. 103(a) as being unpatentable over Mukherjee et al. (USPN 5919587) in view of Jensen (USPN 5141825) as applied to claim 44 above, and further in view of Xue (USPN 5702837).

Mukherjee teaches a method of manufacturing a fuel cell comprising formation of an electrolyte cathode and anode as well as additional layers which would include an interface (catalyst) layer, insulating layer and current passage (separator) (col 11 line 62 - col 12 line 4). The materials are made using the same apparatus wherein cell components are formed from a metal-organic complex containing a transition metal from the group including but not limited to Ti, Co, Ni, Hf and Zr. The organometallic has the common formula $(CH_3-CH_2-CO_2)_nMe$ wherein n is a number ranging from 0 to 72 and Me is a transition metal which will have a valence. Cobalt is typically 3 or 4. The mixture is initially heated to 100 C in the presence of a mineral acid or alcohol (col 12

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lines 5-64 and col 21 lines 46-56) reacted with a Zr salt (col 5 lines 26-46 and lines 55-65). Note that the common formula is an organic functional group which can be combined in a variety of forms. The metal organic is used as a binder for forming the cathode mass (col 21 lines 18-27) and is used as the liquid phase carrier for mixing (col 22 lines 1-36). Combinations of Y and Zr are used as electrolyte materials and doped zirconia (such as YSZ) is a well known electrolyte material. The metal content in the carboxylate is between 2 and 40 wt% that is between 20 and 400g per kg (col 10 lines 9-26). The atmosphere may be air, reducing or inert. Individual electrodes or half elements are heat treated under vacuum at a temperature of 60-110 C (col 27 lines 35-40 and col 28 lines 11 – 26). However, material particle size and shape are not disclosed. Neither are Ce oxide or Ni/Co anodes disclosed.

Jensen teaches synthesis of electrode materials comprising modified Zr oxides having particle size less than 2 microns present in an amount of about 1% (col 3 lines 9-19). Ni and Co particles are spherical with a diameter of 3 to 7 microns (col 3 lines 62-67). Particles may also have a thread like (filamentary) shape (col 3 lines 12-15 and col 4 lines 35-46). CeO₂ may be used as a substitute for ZrO₂ (col 5 lines 47-50). Processing may be performed in an inert atmosphere such as N₂ (col 7 lines 50-60).

However neither reference teaches the Ni or Co to electrolyte powder ratio.

Xue teaches a method of synthesizing a doped lanthanum chromite current passage and porous nickel cermet fuel electrode (col 1 lines 13-26). Ni:Zr ratio is about

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1.1:1.0 at the high end of the range (col 3 lines 53-60). Organometallic mixtures are dispersed and mixed with an organic carrier (binder) and deposited on the cathode and electrolyte respectively after which the assembly is thermally treated for forming. Ni and ZrO₂ are added in equal amounts (col 3 lines 5-52). The ratio of solid and liquid phases is between 1/3 and 6/1 (col 4 lines 28-36). The metal in the cermet is nickel or cobalt (col 3 lines 6-10) and is mixed with rough dispersed ion conductive material (ZrO₂) and 2-20% binder (col 3 line 53 - col 4 line 17). The material is typically deposited as a paste, by brushing or spraying under ambient conditions (col 6 lines 58-64). Parts are heated to a temperature below 1350 C (col 3 lines 53-65).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use equal amounts of electrolyte material (Ce or Zr) and metal (Ni and/or Co) to improve cell efficiency and utilization (Mukherjee, col 4 lines 52-61). Such a composition is simple, conveniently formed and not easily poisoned (fouled) by sulfur (Mukherjee, col 3 lines 18-31).

Response to Arguments

12. Applicant's arguments filed 10/010083 have been fully considered however Mukherjee teaches that the cathode is used for the broad class of instruments which fall under the classification electro-chemical cell. This preferred members of this class in

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which this particular cathode is used includes but is not limited to batteries and fuel cells (col 11 lines 33-37, particularly line 34). The fuel cells comprise a solid electrolyte (col 25 lines 48-55) which can be any material that is stable in the presence of the anode and cathode (col 25 lines 14-20). There is no indication that these materials (the same materials as in the instant claims) cannot operate at high temperatures when placed in a fuel cell as disclosed in col 11 line 34.

Therefore the 102 rejection of claims 1-5, 12-15, 24-29, 33-35, 37 and 38 as anticipated by Mukherjee stand. The 103 rejection of claims 16, 18, 19 and 32 as obvious over Mukherjee et al. (USPN 5919587) in view of Zhen et al. (USPN 6093234) and the 103 rejection of claims 20-22, 30, 49, 50 and 51 as obvious over Mukherjee et al. (USPN 5919587) in view of Jensen (USPN 5141825) also stands and now includes new claims.

13. Regarding applicant's argument that Zhen only teaches powder formation rather than cathode formation, it is noted that the bulk of the reference is used to teach powder formation because compact formation and sintering are well known in the art and not the novelty of the invention (col 3 lines 25-48, particularly lines 31-34). Examples of the powder which is formed in a novel manner being formed into electrodes and other parts of a solid oxide fuel cell are also taught (col 7 line 65 – col 8 line 3). As it is an electrode material, it is presumed to be formed into an electrode which is typically done by

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pressing and sintering at about 1250 C (col 8 line s35-40 and lines 58-64).

Therefore the 102 rejection of claims 6, 8-10, 25, 27-30 and 32 as anticipated by Zhen stands.

Allowable Subject Matter

14. Claims 7, 11, 23 and 36 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter: There is no disclosure of the claimed organic formula used in combination with lanthanide materials particularly BaCeGd oxide or SrCeGd oxide. Neither do the references teach a quantitative growth rate, sintering or thermal formation at a temperature under 400 C in an inert atmosphere to force a particular film thickness. See also Spiewak et al. (USPN 6136412), Debe (USPN 6040077) and Marchetti et al. (USPN 5277996). Zhen teaches a doped LaMnO₃ formed from nitrates but heat treats at higher than 1380 C (1400 C).

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Conclusion

15. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Kawasaki et al. (USPN 5866275, Ni-Ce), Wang (USPN 5364522, carboxylate derived from carboxylic acid, nitrates), Kotchick (USPN 4816036, chromite, electrode, electrode and interconnect formation), Armstrong et al. (USPN 5286322), Haig et al. (USPN 5298469), Olson et al. (USPN 5061402), Yao et al. (USPN 6183914 B1), Lawate (USPN 5681797), Mackay et al. (USPN 6146549, current passage), Carter (USPN 580934, current passage), Nunan et al. (USPN 6013313), Leedham et al. (USPN 5504195), Matsuzaki (USPN 5474800), Wallin (USPN 6017647), Stephenson (USPN 5534468) and Sugikawa (USPN 6080357).

16. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lynne Edmondson whose telephone number is (703) 306-5699. The examiner can normally be reached on M-F from 7-4 with alternate Fridays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Dunn can be reached on (703) 308-3318. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 305-7718 for regular communications and (703) 305-7115 for After Final communications.

Art Unit: 1725

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0651.

Lynne Edmondson
Examiner
Art Unit 1725

A handwritten signature in cursive script, appearing to read 'Lynne Edmondson', followed by the date '2/12/03'.

LRE
February 12, 2003